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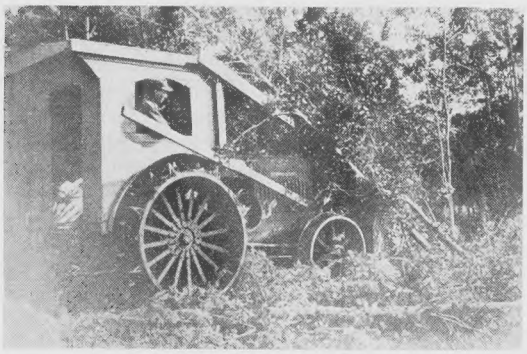
ABOVE—An early type of steam brush cutter

BELOW—An early brush cutter in light cover



The Use of Power Equipment in the Improvement of Alberta Bush Lands

by

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ECONOMICS DIVISION
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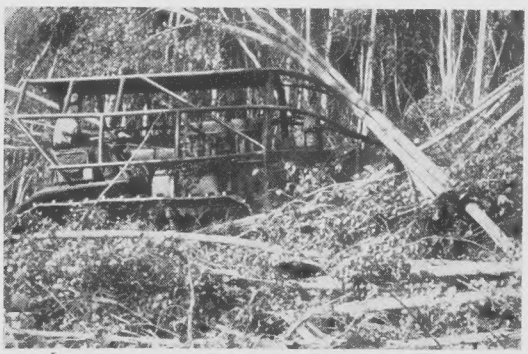
ABOVE—Modern crawler brush cutter

BELOW—A crawler brush cutter in medium cover



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THE USE OF POWER EQUIPMENT IN THE IMPROVEMENT OF ALBERTA BUSH LANDS

B. K. Acton

Introduction.—Potential settlement areas in west central and northern Alberta are situated within the grey wooded soil zone. The development of farms in this region requires the removal of the forest cover before cultivation of the soil is possible. The rapid, efficient and inexpensive improvement of these lands is essential to the establishment of any future settlement on a full-time farming basis.

In the past, because of a scarcity of cash or a lack of power equipment, it has been necessary for settlers in bush areas to improve their farms by a slow, laborious hand method—the axe and grub hoe. Settlement studies indicate that farmers employing hand methods are able to improve between four and eight acres of land per year, depending upon the density and size of the tree cover. At this rate, it is obvious that many years must elapse before a farming unit of economic size can be developed. The cash cost of land improvement by the hand method is difficult to ascertain, as it depends upon the supply and cost of labour. The real cost, however, of this type of development, and a cost that cannot be appraised, is the years of toil that must elapse before a sufficient acreage is improved to adequately support the settler and his family.

Mechanization has taken place in most industries, including agriculture. The use of power machinery in the improvement of bush lands is a natural step in the elimination of inefficient methods. The crawler tractor equipment used to-day in the clearing of farms is superseding the axe and grub hoe, the stump puller, and the small farm engine. Before 1944, there were possibly not more than 12 or 15 units of this modern equipment in use in Alberta. Since then their numbers have increased markedly, as farmers have had cash available to pay for their use. In order to obtain complete information on the rapidity, efficiency, and economy of land improvement by the use of power machinery, several owner-operators of equipment were interviewed.

Definition of Cover.—Tree cover, for purposes of describing methods and costs of land improvement, is classified as light, medium, and heavy. The bush cover of such lands does not include anything as heavy as a timber classification. The following definitions describe the types of cover found on most bush lands considered suitable at the present time for agriculture.

Light cover consists of small trees and scrub reasonably dense.

Medium cover includes trees up to 12 inches in diameter (2 feet above the crown) and scrub medium dense; or fewer trees and scrub reasonably dense.

Heavy cover is tree growth that forms a relatively thick stand of trees up to 12 inches in diameter (2 feet above the crown) and scrub of medium density; or fewer trees and very dense scrub.

It is obvious that the thicker the stand of both trees and scrub, the more work involved in land improvement.

Description of Machines Used.—Power machinery used in the improvement of bush land consists of four main pieces of equipment, as follows:—

1. The crawler tractor, to provide the power.
2. The V-shaped brush cutter.
3. The brush piler.
4. The breaking plough.

The equipment mentioned is worth between $6,000 and $10,000, so it is not likely to be owned by the average settler or established farmer. It is more suited to ownership by a single individual who makes a full-time job of doing custom work, or to be owned by a public agency such as a municipality, or by a settlement agency such as a colonization organization.

Crawler tractors in use at present on land improvement work are commonly of 60 or 75 horse-power, the motor being either of gas or diesel design. There are, however, a few power units in use of 135 horse-power. A V-shaped steel cutting blade, somewhat similar to a snowplough, but having a metal or reinforced timber framework overhanging the machine to protect it and the operator from falling trees, is attached to the front of the tractor. This attachment is made by the use of a centre beam or two side push beams hooked to the rear draw bar of the tractor. This hook-up allows the cutter plenty of play to follow the contours of the ground. The V-shaped blade cuts with a forward shearing action on both sides at ground level; this design permits only a minimum amount of side slippage. The width of the swath cut, depending upon the particular plan of the cutter, varies from 11 feet to 12 feet, 6 inches, for 60 to 75 horse-power units and up to 16 feet for units of 135 horse-power.

Within the past year a machine, called the one-way brush cutter, has come into use. It is a bulldozer converted to an angledozer and having a cutter blade attached which cuts a 10-foot swath. There is also an overhanging framework for the protection of the operator. This machine is useful and efficient for the cutting and piling of light bush cover. That a bulldozer can be easily and cheaply converted into a one-way brush cutter is its main advantage.

The piler, a more recent innovation than the cutter, may be described as a breastwork attached to the front of the tractor, having prongs that jut out at right angles to its base. The piler is used to push the slash into piles for burning. This implement, however, is not always used in the improvement of land. Some farmers prefer to gather the fallen trees for wood, or else save the expense of piling by using a fire or some other method for disposal of the slash.

Implement companies manufacture breaking ploughs of various designs. One operator interviewed had a breaking plough built to specifications from bridge iron material. With this plough—a 22-inch, two-bottom breaker—he can break land through the roots to a depth of 10 inches.

Methods of Land Improvement by the Use of Power Machinery.—There are two general methods used in the improvement of bush lands with power equipment. The main difference in these methods depends upon whether the intention is to break the land the same season, or to delay the breaking a couple of years in order to save the expense of piling.

In the first method, the brush should be cut while the leaves are on the trees. Roots decay more rapidly, if clearing is done during the summer months. On account of the present demand for the limited number of brush cutters available, it is not always possible to have the cutting done when the trees are in full leaf. The debris or slash is then piled, and disposed of by burning. During the same season the land is broken and prepared for crop.

The second method is very similar to the first, except that piling is not done, and instead of improving the land in one season a period of two years is taken. After the brush has been cut it is left for two years, during which time the land is not pastured, thus permitting a thick mat of grass to form. In the spring of the second year a fire is put through the field; the accumulated dead grass aiding in the securing of a good burn. By burning the slash, the expense of piling is avoided, but the use of the land has to be postponed for two years. After the slash has been removed by burning, the same procedure is followed as in the previous method.

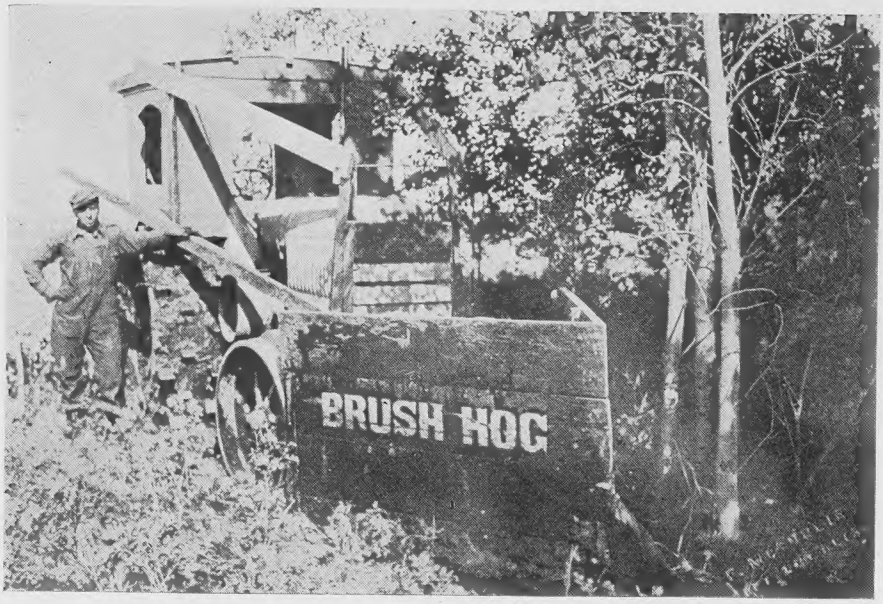

FIG. 1.—The early predecessor of the modern crawler tractor brush cutter.

FIG. 2.—A large poplar is sheared off by a crawler tractor brush cutter.

FIG. 3.—A brush cutter at work in medium cover.

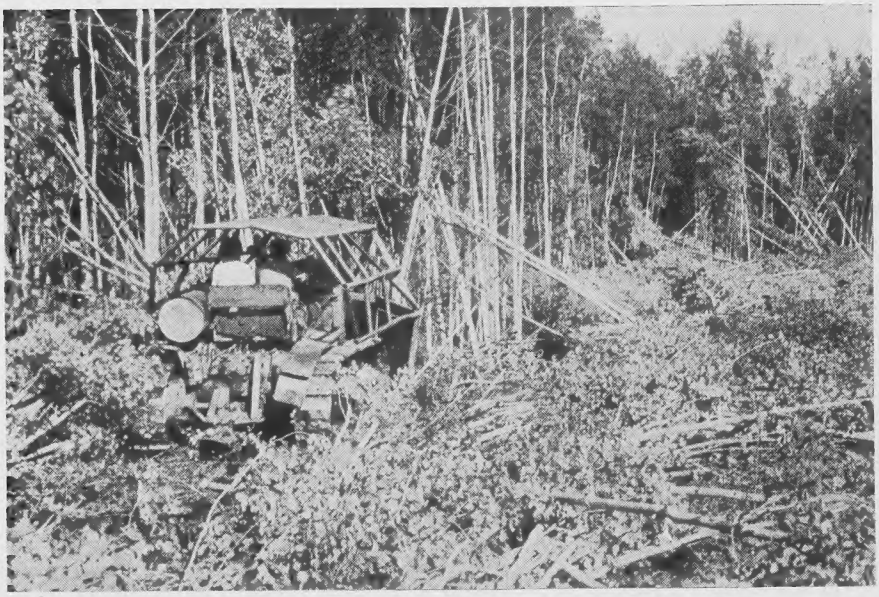

FIG. 4.—This cover was cut and piled at a contract price of $10 per acre.

FIG. 5.—A one-way crawler tractor brush cutter.

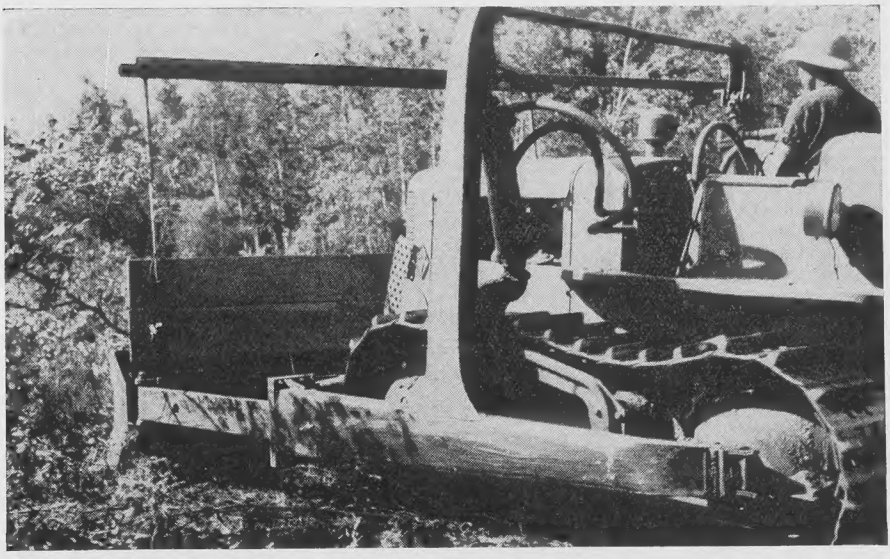

FIG. 6.—A side view of a one-way crawler tractor brush cutter, showing hydraulic lift attachment.

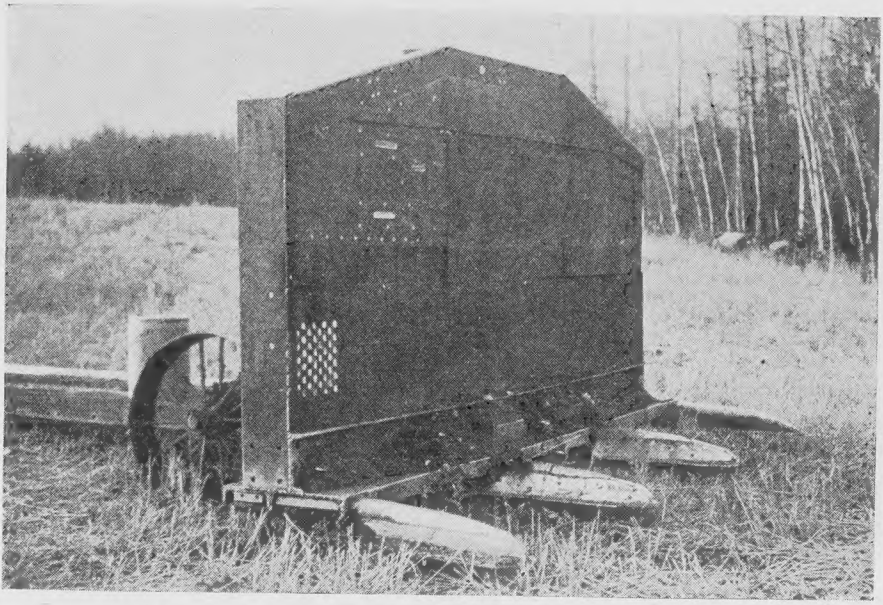

FIG. 7.—A piler.

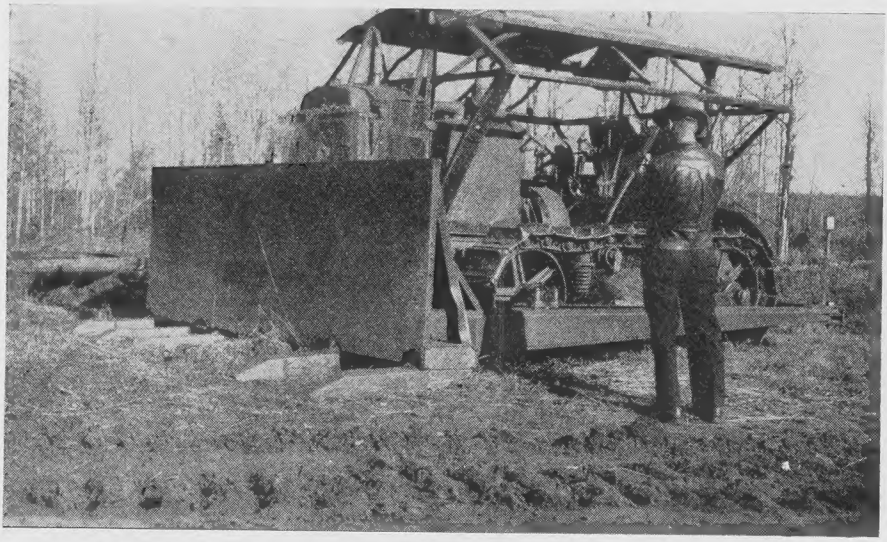

FIG. 8.—It takes 2½ hours to detach the V-shaped brush cutter from the power unit and attach the piler.

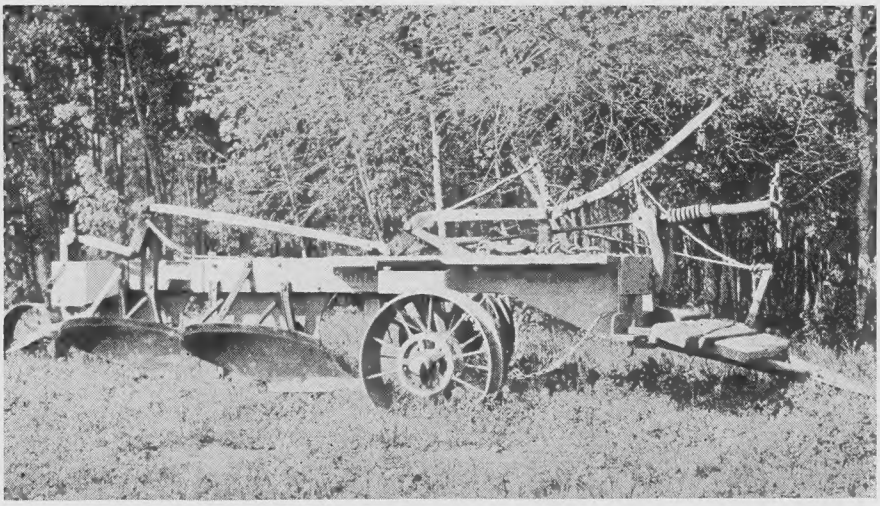

FIG. 9.—A breaking plough capable of breaking through roots to a depth of ten inches.

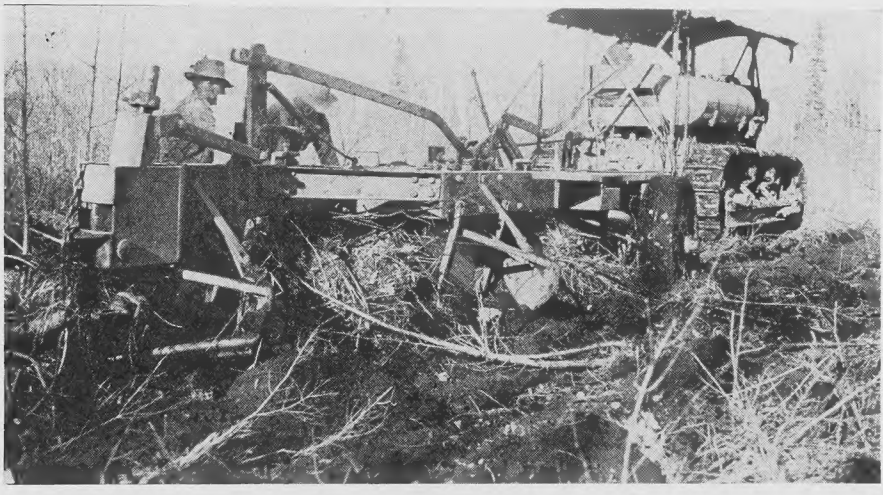

FIG. 10.—Roots are no problem to this breaking plough.

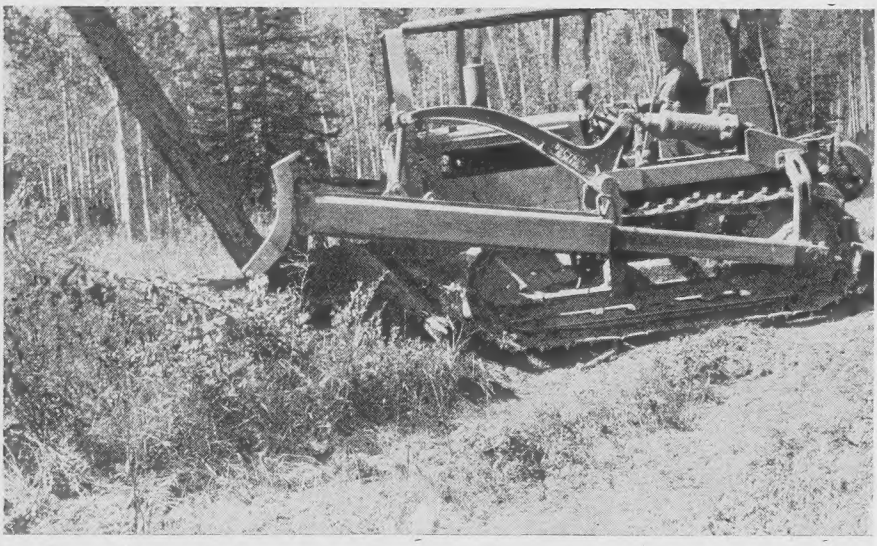

FIG. 11.—A bulldozer pushes a tree over.

FIG. 12.—Tree, roots, and top soil are removed in one operation.

From a cultural standpoint, the time and depth of breaking may be controversial. The method of breaking and of preparing the land for crop is important, as certain practices aid in the elimination of root picking. Some farmers have had very good results by breaking during the month of September to a depth of ten inches. This deep breaking allows for the roots to be broken up and turned well under. Some may object to the deep breaking of grey wooded soils, with the consequent burying of the limited organic matter. Grey wooded soils however, need both legumes and fertilizers, to build up and maintain their fertility. These legumes add organic matter to the soil. The alternative is shallow breaking which necessitates root picking. During the same fall the land should be floated for levelling, disked with a heavy disk, and packed. Any roots that would be troublesome in the preparation of the land for crop, can be brought to the surface by dragging an iron rail across the field from the rear of a tractor. The exposed roots are then gathered into small piles for burning.

By the use of the one-way disk, the improved land is seeded the following spring. "Backsetting" is delayed for three or more years—the roots by this time will have decayed and are no longer a problem. During this period, in the grey wooded soil zone, a legume along with a grain nurse crop is recommended for soil improvement purposes. The legume does not need to be ploughed down for three or four years. If the farm is situated in the black soil zone, the one-way disk can be used to seed in a grain crop, with the introduction of a legume a year or so later, for purposes of weed control.

Types of Contract.—The type of contract preferred by owners of land-improvement equipment is a charge on an hourly basis for brush cutting and piling. The density and size of bush cover, and the topography are seldom uniform on any particular piece of land, which creates difficulties in estimating a per-acre rate. There are, however, cases where the contract designates a definite charge per acre for this work.

Breaking, as a rule, is contracted for at so much per acre. Difficulties associated with breaking can be judged more accurately than those associated with cutting and piling.

Cost of Land Improvement.—The cost of land improvement by the use of power equipment has varied over the past several years, with marked increases in cost between 1943 and 1944. The recent higher price level, together with the scarcity of labour, and a greater demand for the limited equipment available for land improvement, have all contributed to the increased rates being charged. The time required to cut the bush on an acre of land may give a more accurate indication of the efficiency of land improvement by the use of power machinery.

The rates generally charged for bush land improvement in 1943 by 60 and 75 horse-power equipment, were: cutting $8 per hour, piling $6 per hour, and breaking $5 per acre. In 1944 these rates had increased to: cutting $10 per hour, piling $8 per hour, and breaking $7 to $8 per acre. The following two tables set out the cost of bush land improvement in these two particular years by type of cover. Costs, of course, will vary within the ranges mentioned in the tables, according to the density and size of trees.

TABLE 1.—Estimated Rate and Cost of Bush Land Improvement, 1943

—	Acres Cleared per Hour	Cost of, per Acre			Total Cost per Acre
		Cutting	Piling	Breaking	
	Ac.	$	$	$	$
Light Cover	4	2.50	1.50	5.00	9.00
Medium Cover	2	4.00	3 00	5.00	12.00
Heavy Cover	1	8.00	4.00	5.00	17.00

TABLE 2.—Estimated Rate and Cost of Bush Land Improvement, 1944 & 1945

—	Acres Cleared per Hour	Cost of, per Acre			Total Cost per Acre
		Cutting	Piling	Breaking	
	Ac.	$	$	$	$
Light Cover	4	3.00	2.00	8.00	13.00
Medium Cover	2	5.00	4.00	8.00	17.00
Heavy Cover	1	10.00	6.00	8.00	24.00

Rates charged for equipment of the 135 horse-power design average $15 per hour. The costs per acre for cutting, however, are approximately the same as those shown in Table 2.

The figures in the tables are for brush cutting, piling, and breaking only. If a farmer adopts the second method of land improvement as previously described, the cost of piling will be saved. No attempt has been made to appraise the cost of preparation of the land for crop, as this is assumed to be more or less a part of the routine work on the farm.

The Possibilities of Power Equipment for Bush Land Improvement.—The following notes are summaries of opinions voiced by contractors now doing bush land improvement work.

Any project that would involve the improvement of large acreages of land located in blocks would promote greater efficiency because:—

1. An investment would be warranted in 95, 110 or 135 horse-power equipment, thus replacing the 60 and 75 horse-power machines in present use.

2. Experience has indicated improvements in machinery design that would facilitate greater efficiency and economy in the work. The expense of installing these improvements would be justified if contractors were certain of securing adequate work in the future.

One owner of power equipment felt that with bigger and more modern machinery, and with a large program of work assured, that present costs of bush land improvement, as shown in Table 2, could be cut in half.

The Place of the Bulldozer in Bush Land Improvement.—Lands having a cover as heavy as a timber classification would present somewhat different problems than bush (as defined), from the standpoint of rapid and economic improvement. Stands of merchantable timber should be used as such and not destroyed. Controlled fires could be used as an aid in the removal of non-commercial trees.

In the clearing of timber lands the crawler bulldozer has possibilities. This machine is capable of removing large trees at a rapid rate. As an implement to compete with the brush cutter in the improvement of bush lands (non-timber), the bulldozer is not so efficient because:—

1. It is slower than the brush cover and consequently more costly.

2. It removes the top soil to a large extent.

3. Soil clings to the roots and stumps of uprooted trees, making burning difficult.

4. The bulldozer pushes the slash forward, with the result that the uprooted trees must be pushed aside before further clearing is possible.

The brush cutter, piler, and heavy breaking plough seem to offer the best possibilities for the quick and cheap improvement of bush lands suitable for agriculture. This, of course, is dependent upon the capable operation of the machines and a proved method of land improvement being followed.

Power equipment makes the clearing of large tracts of bush land easy. Because of this, farmers are reminded that the farm should have a wood lot. It must also be remembered that trees aid in the conservation of the farm's water supply, and help to control soil erosion.